

REMARKS

At the time of the Office Action dated December 12, 2002, claims 1-12 were pending in this application. Of those claims, claims 1-3 and 7-12 have been rejected. Applicants acknowledge, with appreciation, the Examiner's indication that claims 4-6 contain allowable subject matter.

Claims 3-5 have been amended, and claims 13-16 have been added. Care has been exercised to avoid the introduction of new matter. Specifically, claim 3 has been amended to recite that the tantalum oxide film consists of tantalum and oxygen, which finds adequate descriptive support throughout the originally filed disclosure, for example, on page 12, line 18. Claims 4 and 5 have been amended to be placed in independent form. New claims 13 recites that a bottom of a contact plug is formed with a conductor different from tungsten, consistent with page 11, line 1. New claim 14 recites that a tantalum oxide film consists of Ta_2O_5 , consistent with page 12, line 18. Claims 15 and 16 are respectively similar to claims 1 and 3, except claims 15 and 16 do not recite limitations related to a contact plug.

Applicants have also amended the specification to replace each occurrence of the unit "V" with "eV." One having ordinary skill in the art would recognize that these units are used interchangeably. Applicants submit that the present Amendment does not generate any new matter issue.

Claims 7 and 10 are rejected under the first paragraph of 35 U.S.C. § 112

On page three of the Office Action, the Examiner asserted that claims 7 and 10 contain subject matter not supported by the original disclosure. In particular, the Examiner asserts that the specification does not disclose tantalum nitride film with a work function up to 5.41eV. This rejection is respectfully traversed.

Page eleven of the specification discloses that the work function of a tantalum nitride film is greater than 4.95eV and that the work function of a tantalum nitride film in a certain embodiment of the invention is 5.41eV. Claims 7 and 10 respectively depend upon claims 1 and 2, which recite that the work function of a tantalum nitride film is greater than 4.95eV. Thus, the disclosure in the original specification supports the claim limitation that the work function of the tantalum nitride films is up to 5.41eV, as recited in claims 7 and 10. Applicants, therefore, respectfully solicit withdrawal of the imposed rejection of claims 7 and 10 under the first paragraph of 35 U.S.C. § 112.

Claims 1 and 8-9 and claims 2 and 11-12 are separately rejected under 35 U.S.C. § 102 for lack of novelty as evidenced by Choi et al., U.S. Patent No. 6,168,991 (hereinafter Choi)

On pages four and five of the Office Action, the Examiner asserted that Choi identically describes the claimed invention as recited in claims 1-2, 8-9 and 11-12. These rejections are respectfully traversed.

In the Amendment filed October 18, 2002, Applicants amended claims 1 and 2 to recite that the tantalum nitride films of a storage electrode and a cell plate electrode each have a work function greater than 4.95eV. Applicants then argued that Choi fails to teach or suggest this feature. In the present Office Action, the Examiner has responded to these arguments by referring to column 5, lines 26-30 of Liang et al., to support an allegation by the Examiner that tantalum nitride having a work function greater than 4.95eV is inherent.

Applicants submit that the Examiner's reliance upon the doctrine of inherency to disclose tantalum nitride having a work function greater than 4.95eV is misplaced. Inherency may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient to establish inherency.¹ To establish inherency, the extrinsic evidence must make clear that the missing element must necessarily be present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill.²

Applicants have attached two articles that indicate that the work function of tantalum nitride can be below 4.95eV. The article by Gotoh et al. discloses a work function for tantalum nitride of 4.78 eV and 4.80eV, and the article by Rogers discloses a work function for tantalum nitride of 4.20 eV. As these two references clearly disclose, tantalum nitride does not necessarily have a work function greater than 4.95eV. Thus, the Examiner cannot rely upon the doctrine of inherency to disclose this feature, and the Examiner has failed to identically describe the claimed

¹ In re Rijckaert, 9 F.3d 1531, 28 USPQ2d 1955 (Fed. Cir. 1993) (reversed rejection because inherency was based on what would result due to optimization of conditions, not what was necessarily present in the prior art); In re Oelrich, 666 F.2d 578, 212 USPQ 323, (CCPA 1981).

² Finnegan Corp. v. ITC, 180 F.3d 1354, 51 USPQ2d 1001 (Fed. Cir. 1999); In re Robertson, 169 F.3d 743, 49 USPQ2d 1949 (Fed. Cir. 1999); Continental Can Co. USA v. Monsanto Co., 20 USPQ 2d 1746 (Fed. Cir. 1991); Ex parte Levy, 17 USPQ2d 1461 (BPAI 1990).

invention within the meaning of 35 U.S.C. § 102. Applicants, therefore, respectfully solicit withdrawal of the imposed rejections of claims 1-2, 8-9 and 11-12 under 35 U.S.C. § 102 based upon Choi.

Claim 3 is rejected under 35 U.S.C. § 103 for obviousness predicated upon Kang, U.S. Patent No. 6,211,005, in view of Drynan

On pages six through seven of the Office Action, the Examiner has taken a reference (i.e., Kang) with a broad disclosure as to various materials that can be used for the electrodes and dielectric of a capacitor and combined this broad disclosure with the teachings of Drynan. This rejection is respectfully traversed.

On page two of the statement of the rejection, in responding to Applicants arguments in the Amendment filed October 18, 2002 the Examiner stated:

the term "tantalum oxide" has plain and ordinary meaning and does apply to the tantalum oxide found in the prior art as offered by Kang.

In response, Applicants question the source of Examiner's "plain and ordinary meaning" for tantalum oxide, as the Examiner has apparently made this assertion about the "plain and ordinary meaning" without any factual basis. Applicants, therefore, respectfully request that the Examiner provide support for this allegation that the plain meaning of tantalum oxide includes $\text{SrBi}_2\text{Ta}_2\text{O}_9$.

Claim 3 has been amended to recite that "said tantalum oxide film consists of tantalum and oxygen" (emphasis added). In the statement of the rejection, the Examiner asserted that the disclosure of $\text{SrBi}_2\text{Ta}_2\text{O}_9$ in Kang is an identical disclosure of tantalum oxide. This $\text{SrBi}_2\text{Ta}_2\text{O}_9$ material, however, cannot be considered an identical disclosure of a tantalum oxide film that

consists of tantalum and oxygen, as recited in claim 3. Therefore, the Examiner cannot establish that either Drynan or Kang teaches or suggests the tantalum oxide film recited in claim 3.

In the statement of the rejection, in responding to Applicants' arguments that the Examiner has failed to establish a proper motivation to modify Kang in view of Drynan, the Examiner stated:

Ample arguments for motivation and combinability of the relevant teaching by Drynan have been presented in the rejection of claim 3. Applicant [sic] does not address, in his traverse, why said arguments are incorrect.

Applicants respectfully disagree with the Examiner's assertion that Applicants did not address why the Examiner arguments are incorrect. Referring to an argument Applicants made in the Amendment filed November 29, 2001:

Drynan teaches away from the claimed invention by teaching that not only the contact plug be formed from tungsten, but also the top and bottom electrodes. The purpose stated by Drynan for creating a bilayer (W/W) structure is reduced resistance.

In contrast, claim 3 recites "a first indium oxide film formed on and contacting an upper surface of said contact plug." As such, Drynan teaches away from the claimed invention.

Applicants also refer the Examiner to the argument made in the Amendment filed March 18, 2002, which discussed the Examiner's asserted motivation to combine Drynan with another reference:

The Examiner's recited motivation to combine Alers 1 with Drynan, however, is illusory. The Examiner has asserted that there are positive properties associated with using tungsten for a plug (or, in fact, for almost any other conducting feature in a semiconductor device), and it is the benefit obtained from these properties that the Examiner argues provides sufficient motivation to modify Alers 1 with Drynan. However, any material that can be used as a plug in a semiconductor device has advantageous properties. Furthermore, while using the type of analysis applied by the Examiner, any combination of materials in a standard structure (such as a capacitor) is obvious because each and every material that could be used in the structure has some benefit, and this benefit can be used as a basis for a motivation to combine the materials. However, this type of analysis ignores whether the claimed invention as a whole is obvious over the applied prior art. In analyzing whether the claimed invention as a whole, the Examiner cannot consider the

invention as only a collection of claimed parts (or features). Rather, an "invention as a whole" analysis also requires the Examiner to consider the claimed interactions between the claimed parts (or features).

The Examiner asserted the same motivation to combine Drynan with Alers 1 as the Examiner asserted to combine Drynan with Kang. Thus, Applicants' argument presented above also applies to the Examiner's motivation to combine Drynan and Kang. The Examiner is only looking at pieces of the invention instead of focusing on the invention as a whole. For example, the Examiner has not establish any motivation for a storage electrode including indium oxide film formed on a tungsten contact plug, as recited in claim 3. Instead, the Examiner has only focused on the disclosure of separate pieces (i.e., indium oxide storage electrode and tungsten contact plug) of this limitation while ignoring the interactions between the separate pieces.

Furthermore, as previously argued in the Amendment filed October 18, 2002, the Examiner has also engaged in impermissible hindsight reconstruction of the claimed invention in view of the teachings of Kang and Drynan. Specifically, the Examiner has failed to provide any reason why one having ordinary skill in the art would have selected the combination of materials recited in claim 3 from the multitude of possible combinations disclosed by Kang.

For the reasons stated above, Applicants respectfully submit that the imposed rejection of claim 3 under 35 U.S.C. § 103 for obviousness predicated upon Kang in view of Drynan is not factually or legally viable and, hence, solicit withdrawal thereof.

New claim 13 recites that a bottom of a contact plug is formed with a conductor different from tungsten. Claim 13 depends upon claim 1 and is patentable over the applied prior art at least based upon that dependency. New claim 14 recites that a tantalum oxide film consists of

Ta₂O₅ and is distinguishable from the combination of Drynan and Kang because Kang teaches a layer formed from SrBi₂Ta₂O₉. Claims 15 and 16 are respectively similar to claims 1 and 3, and are patentable over the applied prior art for similar reasons to why claims 1 and 3 are patentable over the applied prior art.

Applicants have made every effort to present claims which distinguish over the prior art, and it is believed that all claims are in condition for allowance. However, Applicants invite the Examiner to call the undersigned if it is believed that a telephonic interview would expedite the prosecution of the application to an allowance. Accordingly, and in view of the foregoing remarks, Applicants hereby respectfully request reconsideration and prompt allowance of the pending claims.

To the extent necessary, a petition for an extension of time under 37 C.F.R. § 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 500417, and please credit any excess fees to such deposit account.

Respectfully submitted,

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